

VII.—This storm was of feeble energy. It was first observed in the Northwest Territory and was central in northern Montana on the morning of the 20th. Rain began in the northern quadrants of the storm on the afternoon of the 22d. Winds were light, excepting on the coast of North Carolina, where maximum velocities of thirty-five miles were reported. The maximum temperatures of the month were reported on the 21st and 22d from stations in Wyoming, south Dakota, Nebraska, Kansas, Colorado, and Utah, and on the 19th and 20th from stations in Washington and Oregon.

VIII.—On the 3 p. m. chart of the 20th an area of low pressure is shown to be central in the Atlantic east of Massachusetts. It moved in a direction slightly to the east of north across the Maritime Provinces of Canada, the pressure de-

creasing to 29.46 when last observed at 7 a. m. of the 22d. It was attended by light winds and rain or snow.

IX.—This depression probably moved southeastward from the north Pacific. Its direction of movement changed near the one hundred and seventh meridian. The area was stationary near Fort Buford, Dak., from 10 p. m. of the 24th for twenty-four hours, when the pressure declined to 29.32. It disappeared to the northeast after 3 p. m. of the 26th. Generally fair weather prevailed within the area until the night of the 25th, when light rains occurred over Montana and Dakota. High winds were reported over Nebraska, Dakota, and northern Minnesota during the 24th and 25th. Under the influence of this area the maximum temperatures occurred over eastern Montana, northern Dakota, and Minnesota.

#### NORTH ATLANTIC STORMS FOR APRIL, 1888.

[Pressure in inches and millimetres; wind-force by Beaufort scale.]

The paths of the depressions that appeared over the north Atlantic Ocean during April, 1888, have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels, received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Of the ten depressions traced, seven originated west of the fiftieth meridian, and pursued east to northeast tracks over Newfoundland or the Grand Banks; one advanced northwestward from the vicinity of the Azores; one moved eastward over the Bay of Biscay, and one first appeared over mid-ocean near the fifty-fifth parallel, and thence passed eastward to the British Isles. The month opened with unsettled weather and fresh to strong gales between the thirtieth and sixtieth meridians, attending the presence of two areas of low pressure, one of which was located over the Banks of Newfoundland, and the other to the northward of the Azores. A third depression was apparently central off the coast of Portugal. Over the British Isles and off the American coast south of the fortieth parallel the pressure was relatively high. During the balance of the first decade the weather continued unsettled over the western portion of the ocean, with marked barometric fluctuations. During this period the pressure continued generally high east of the thirtieth meridian. From the 10th to the 20th, inclusive, three important storms appeared, one of which traversed the ocean from coast to coast; one passed from the Banks of Newfoundland to the eighteenth meridian, and one, of tropical or subtropical origin, advanced from the vicinity of Bermuda to Newfoundland, and thence moved northeastward and disappeared over mid-ocean. During the third decade high barometer and generally fair weather prevailed over mid-ocean until the 29th, during which and the following date fresh to strong gales occurred. Over the British Isles and the ocean to the southward the last ten days of April constituted the stormy period of the month, although from the 25th to the 27th, inclusive, the barometer was high in that region. From the 20th to the 24th the weather was unsettled west of the fiftieth meridian, after which fair weather and high barometer prevailed until the 28th, when the advance north-northeastward of a depression of small energy from near Bermuda caused lower pressure and moderate gales.

In April, 1887, eleven depressions were traced, the tracks predominating to the southward and southeastward of Nova Scotia and Newfoundland. But one depression was traced from American waters to the European coast. The general character of the weather over the ocean was very severe, and gales of hurricane force were encountered off the coast of the United States during the first five days of the month. From the 12th to the 16th, inclusive, storms of exceptional violence occurred over, and to the eastward of, the Banks of Newfoundland. During the last decade of the month the weather conditions in the trans-Atlantic routes were more settled, although

strong gales were experienced over the western portion of the ocean from the 26th to the 29th.

As compared with the corresponding month of previous years the storms of April, 1888, were deficient in number and energy.

In the following descriptions of the depressions traced, positions are given in degrees, latitude and longitude, except in cases where twenty-five to thirty-five minutes are cited, when they are shown in degrees and half degrees:

1.—This depression was central on the 1st over the southeastern part of the Banks of Newfoundland, whence it had advanced from the westward. In this position barometric pressure below 29.50 (749.3) was shown, and moderate to fresh gales prevailed. By the 2d the centre of depression had moved northeast to the thirty-ninth meridian, with an increase in pressure of about .20 inch, after which it apparently recurved westward under the influence of a depression passing northeast over Newfoundland, and an area of high pressure overlying the ocean east of the thirtieth meridian.

2.—This was a well-defined storm of small energy which moved northwest from the vicinity of the Azores during the 1st and united with depression number 1 by the 2d.

3.—This depression was a continuation of land low-area number i which traversed the North American continent and passed eastward from Nova Scotia during the 2d. On the morning of the 3d the depression was central off the west coast of Newfoundland, with pressure below 29.60 (751.8), from which position it moved northeast beyond the region of observation.

4.—This depression was the continuation of land low-area number ii which traversed the American continent and advanced northeast over the Gulf of Saint Lawrence during the 6th. On the 7th the storm was central near Anticosti Island, and thence advanced over the ocean north of Newfoundland.

5.—This depression first appeared on the 10th off the east edge of the Banks of Newfoundland, with pressure about 29.70 (754.4), whence it advanced east-northeast to the westward of the British Isles by the 15th, attended by a gradual decrease in central pressure and gales of increasing energy. Subsequent to the 15th the storm-centre recurved south and west and united with depression number 6, which had followed closely in its wake.

6.—This depression is first charted southwest of Nova Scotia under date of the 13th, whence it moved rapidly east-northeast to the north of Ireland by the 17th, accompanied after the 14th by disturbances of pronounced strength. By the 18th the centre of depression had recurved southward over Ireland, with pressure falling below 29.50 (749.3), from which position it moved eastward beyond the region of marine observations.

7.—The pressure of this depression to the southward of Bermuda was indicated by reports of the 14th. By the 15th the storm-centre had moved northward to the fortieth parallel, and during the 16th and 17th remained nearly stationary

south of Newfoundland, with pressure falling to about 29.40 (746.7). By the 18th the depression had advanced northward over Newfoundland, with pressure below 29.20 (741.7). During the next two days the storm is given a probable east and northeast track to N. 55°, W. 38°, from whence it passed south-east and disappeared, or, as appears probable, continued an eastward course to the French coast as depression number 8.

8.—This depression moved slowly eastward over the Bay of Biscay during the 22d and 23d, with central pressure about 29.60 (751.8), after which it disappeared over the continent.

9.—This depression appeared over mid-ocean, near the fifty-fifth parallel, on the 29th, with pressure about 29.20 (741.7), and moved eastward to Ireland by the 30th, with barometric minimum about 29.00 (736.6), and strong to whole gales over a considerable area.

10.—This depression was unimportant, though well-defined, and advanced from the vicinity of Bermuda to Newfoundland during the 29th and 30th, its passage being unattended by noteworthy features.

## OCEAN ICE.

On chart i the positions of icebergs and field ice reported during the month are shown by ruled shading. Mr. John Higgins, observer at Saint John's, N. F., reports, relative to ice, as follows: "Ice on the coast 13th to 18th; moving off 19th to 24th; cleared off, 27th; driving in, 28th to 30th." On the 1st the s. s. "Pontiac" passed twenty to thirty icebergs between Saint John's and Cape Pine. 2d, s. s. "Austrian" passed large quantities of detached field ice from N. 46° 00', W. 52° 30', to Saint John's, N. F. 4th, s. s. "Dorian," in N. 41° 40', W. 49° 10', at 7 a. m., encountered a large ice-field, and steered southerly till 8.30 p. m., when the western edge of the ice was abeam. 5th, s. s. "Michigan," in N. 41° 33', W. 50° 00', one moderate sized berg. 7th s. s. "Austrian," between Saint John's, N. F., and Cape Race, passed about forty bergs. 13th, s. s. "Bengore Head," in N. 47° 40', W. 40° 00', loosely packed field ice, and 14th same vessel, in N. 46° 32', W. 52° 00', field ice. 14th, bark "Lillian B. Jones," N. 46° 06', W. 53° 46', one large berg, and on 15th, same vessel, in N. 46° 55', W. 52° 45', heavy field ice. 17th, heavy, close-packed ice blocked the coast at Cape Race. 19th, s. s. "Boston City" reported the coast of Saint John's, N. F., almost completely blocked with ice. 24th, s. s. "Portia," from Saint John's, N. F., to Cape Race, passed large quantities of heavy field ice and a great number of icebergs. 26th, s. s. "Nova Scotia," from N. 46° 31', W. 53° 02' to Saint John's, N. F., several bergs. 27th, s. s. "Vancouver," off Cape Race, ice-fields; in N. 47° 20', W. 59° 54', field ice. 28th, s. s. "Glen-dale," off Cape Race, quantities of field ice. 29th, large quantities of Arctic ice and bergs off Bacalhao Island. 30th, s. s. "Lake Huron," 75 miles wsw. of Cape Race, one iceberg. 30th, s. s. "Nova Scotian," between Cape Spear and Cape Race, several bergs and field ice.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for April during the last six years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
April, 1883.....	40 49	52 06	April, 1883.....	48 00	43 00
April, 1884.....	41 26	48 46	April, 1884.....	45 25	43 34
April, 1885.....	41 40	49 50	April, 1885.....	44 10	39 41
April, 1886.....	40 51	46 39	April, 1886.....	47 43	30 11
April, 1887.....	40 02	50 04	April, 1887.....	48 00	38 18
April, 1888.....	41 33	50 00	April, 1888.....	47 40	49 00

Compared with the ice record for corresponding months of previous years the aggregate quantity of ice reported during April, 1888, was largely deficient, save in the immediate vicinity of

the Newfoundland coast, where heavy field ice and icebergs were observed throughout the month. Ice was encountered on two dates only off the southern edge of the Banks of Newfoundland, and the latitudes in which it was reported corresponded closely with the average southern limit of ice for April. The easternmost ice reported for April, 1888, was over eight degrees west of the average eastern limit for the month.

## FOG.

The limits of fog-belts to the westward of the fortieth meridian are shown on chart i by dotted shading.

As compared with the chart for March, 1888, slight changes are shown in the limits of the Newfoundland fog-belt, and the number of days during which fog prevailed in that region, twenty-two, was six more than the aggregate number of foggy days reported for the preceding month. Along the coast of the United States fog was more frequently encountered than in March, while its southern limit was contracted about one degree.

With the exception of four dates, the 25th to the 28th, inclusive, during which southerly winds and high barometer prevailed, the development of fog over the Banks of Newfoundland was dependent upon the circulation of winds in the south or east quadrants of low barometer areas. To the westward of the Grand Banks fog was reported on fourteen dates, its development, as a rule, attending the approach or passage of cyclonic areas.

The following are the limits of fog-areas on the north Atlantic Ocean during April, 1888, as reported by shipmasters:

Date.	Vessel.	Entered.			Cleared.		
		Lat. N.	Lon. W.	Time.	Lat. N.	Lon. W.	Time.
3	S. S. Murciano.....	40 58	50 13	.....	41 28	47 31	At inter-vals.
5-6	S. S. City of Washington.	New York.	Off Sandy Hook	3 p. m. ....	37 03	74 45	3 p. m.
5-6	S. S. Holland .....	Off Sandy Hook	8 p. m. ....	40 15	73 05	4 a. m.	
5-6	Brig Lucy W. Snow .....	Davis Shoal Lt.	Noon.	42 04	69 38	Noon.	
6	S. S. Chicago.....	42 02	66 49	1 a. m. ....	42 03	68 10	8 a. m.
6	S. S. James Turpie .....	41 49	65 34	6 a. m. ....	42 08	66 35	Noon.
7	S. S. Rhynland.....	41 32	46 59	3-30 p. m. ....	41 22	47 29	5-40 p. m.
7-8	S. S. India .....	41 55	47 40	8-30 p. m. ....	41 29	49 50	10 a. m.
8	S. S. Geiser .....	42 00	47 20	.....	41 10	50 25	4 p. m.
8	S. S. Buffalo .....	41 53	50 06	11-10 a. m. ....	42 08	48 58	3-40 p. m.
9	S. S. Polynesia .....	42 45	50 03	6 a. m. ....	42 32	51 16	2 p. m.
10	S. S. Italy .....	42 35	48 23	1-30 a. m. ....	42 44	48 01	4-12 a. m.
10-11	S. S. Dorian.....	40 24	72 53	.....	40 27	73 38	.....
11	S. S. Maine .....	38 00	73 00	2-30 a. m. ....	37 56	74 00	7-10 a. m.
11	S. S. State of Indiana....	40 39	68 41	3 a. m. ....	40 28	71 24	Noon.
11-12	S. S. City of Augusta....	38 00	75 00	4 p. m. ....	40 22	74 00	9 a. m.
13	Fog at Saint John's, N. F.	43 54	49 00	7 a. m. ....	43 30	49 30	9 a. m.
13	S. S. Furnessia .....	46 11	50 20	3 a. m. ....	45 37	51 40	7 a. m.
13	S. S. Oregon .....	47 30	49 44	10-30 p. m. ....	45 58	53 21	Noon.
13-14	S. S. Bengore Head .....	40 30	68 48	8 a. m. ....	40 29	69 00	8-28 a. m.
15	S. S. Servia .....	42 40	48 30	11-30 a. m. ....	42 36	48 54	1-30 p. m.
15-18	Fog at Saint John's, N. F.	39 27	68 24	8 p. m. ....	39 51	69 15	Midnight.
18	S. S. Brooklyn City.....	42 40	49 30	6 p. m. ....	42 36	50 10	9-30 p. m.
20	S. S. Balder .....	40 32	66 45	6 p. m. ....	41 19	67 10	4 a. m.
20	S. S. Lord Clive .....	42 43	49 27	11-30 a. m. ....	42 22	51 17	7-50 a. m.
20-21	S. S. Catalonia .....	37 31	72 20	Noon	41 06	68 35	8 a. m.
20-21	S. S. Bratsburg .....	41 50	61 35	8 a. m. ....	41 45	62 10	11 a. m.
21	S. S. LaBretagne.....	42 30	49 00	11 p. m. ....	42 30	50 00	8 a. m.
21-22	S. S. Siberian .....	43 51	48 00	8 p. m. ....	43 20	56 00	2 a. m.
22	S. S. Fulda .....	43 00	50 50	.....	42 47	52 07	.....
22	S. S. Wyoming .....	40 20	48 27	10 a. m. ....	40 12	49 07	1 p. m.
22	S. S. Switzerland .....	46 20	44 30	.....	44 32	48 26	.....
22	S. S. Thingvalla .....	43 56	47 00	4 p. m. ....	43 23	51 00	8 a. m.
22-23	S. S. Norseman .....	44 09	48 52	.....	43 43	51 45	.....
23	S. S. Thingvalla .....	43 35	48 32	.....	42 40	52 29	.....
23-24	S. S. Adriatic .....	43 04	50 22	.....	42 46	51 50	8 p. m.
24	S. S. Taormina .....	45 05	48 50	11-30 a. m. ....	44 30	52 10	8-30 p. m.
24	S. S. Trave .....	46 53	41 50	7-30 p. m. ....	43 20	51 56	4 p. m.
24-26	S. S. Bulgarian .....	41 59	46 32	6 p. m. ....	41 30	49 13	6 a. m.
25-26	S. S. British Prince.....	44 10	46 00	3-04 p. m. ....	43 00	51 00	3-24 a. m.
26-27	S. S. Arizona .....	42 32	48 21	10 p. m. ....	41 53	52 04	9 a. m.
26-27	S. S. Hibernian .....	41 40	49 04	7 p. m. ....	41 38	52 00	10-50 a. m.
27-28	S. S. Auriana .....	41 42	58 50	11-44 p. m. ....	41 00	65 00	4-20 p. m.
27-28	S. S. Baltimore.....	38 20	66 20	Noon	38 08	67 16	4 p. m.
28	S. S. Walsland .....	41 15	46 34	9-45 a. m. ....	41 03	47 04	Noon.
28-29	S. S. British Prince.....	40 02	65 16	11 p. m. ....	39 47	68 03	10 a. m.
29	S. S. Lydian Monarch .....	40 33	64 05	1 p. m. ....	40 30	66 00	11 p. m.
29-30	S. S. Galileo .....	41 38	46 40	12-20 p. m. ....	41 19	49 10	10-45 p. m.
30	S. S. Hibernian .....	40 20	62 30	5 a. m. ....	40 05	66 09	8 a. m.
30	S. S. Lydian Monarch.....	40 35	71 50	7 p. m. ....	40 35	72 10	9-45 p. m.
30	S. S. Rhaetia .....	44 23	45 40	.....	.....	.....	.....
30	S. S. Lahn .....	44 13	42 45	10 p. m. ....	44 09	42 57	10-45 p. m.